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"the broad geologic significance" of the unconformity at the base of the Lance is not known and since the other evidence is not conclusive, the authors designate the Lance as of Cretaceous or Tertiary age. The upper 200-300 feet of the Lance is of marine origin and contains a fauna very similar to that of the Fox Hills, if not identical with it. The remainder are fresh-water beds. Tertiary Fort Union sandstone and shale succeed the Lance conformably. The terraces along the Grand River are due to deposition in a lake formed by ice which extended down the Missouri Valley damming Grand River. Glacial bowlders (from a few inches to several feet in diameter), mostly of granite, are scattered over the whole northeastern half of the area. Most of the terrace gravel and scattered bowlders are early Pleistocene, while the gravels on the Missouri River are later Pleistocene. The strata of the region dip gently to the northwest. Lignite is contained as lenses a few inches thick in beds of carbonaceous shale in the Lance and Fort Union formations. The lignite beds are described as they occur in the various townships. The lignite will probably never be mined on a large scale but will continue to be worked for local consumption.

V. O. T.

The Geology of Long Island, New York. By MYRON L. FULLER. Prof. Paper, U.S. Geol. Survey, No. 82, 1914. Pp. 231, pls. 27, figs. 205, maps 2.

Long Island extends from the Narrows at the entrance of New York Harbor to a point nearly due south of the eastern boundary of Connecticut, a distance of 118 miles; its maximum width is 20 miles. The report deals chiefly with the Pleistocene geology. Long Island "may be considered as affording the type section of the earlier glacial deposits of the coastal zone"; the Iowan stage alone is absent. The literature on Long Island from 1750 to the present is summarized. Some forty pages are devoted to a thorough discussion of the physiography. It appears that Long Island Sound is a partly filled valley, cut in Cretaceous strata, produced by an eastward-draining river system. Its excavation began in post-Miocene time, was interrupted, and then completed in post-Mannetto (Aftonian?) time. The Hudson channels were formed in the Pleistocene.

The pre-Cretaceous rocks include the Fordham gneiss (pre-Cambrian), the Stockbridge dolomite (Cambrian and Ordovician), Ordovician and later granite dikes and pegmatite masses intruded into the gneiss. The beds are faulted and closely folded.

From the base up, the general sequence of the Cretaceous beds is as follows: basal clays (150 feet), Lloyd sand (85 feet), red clays (200 feet), white sand (100 feet), yellow clay (75 feet), dark clay (75 feet), undifferentiated (600 feet), buff clay (100 feet), yellow sand (150 feet), marl (10 feet). The basal clays and Lloyd sand are encountered only in wells. The surface Cretaceous beds are considerably folded (some overturned folds occur) and faulted, while at slight depths they have a gentle, even dip to the southeast. The lower beds are basal Upper Cretaceous.

There is a possibility that marls (here placed in the Cretaceous) may be Eocene, that the loose yellow quartz sand (here considered Cretaceous) overlying the marls may be Miocene; and that the white or yellow sands (here included in the Cretaceous) that succeed the Cretaceous clays may be of Lafayette age.

The Pleistocene deposits (with their probable time equivalents in parentheses) are: the glacial Mannetto gravel (pre-Kansan), the glacial Jameco gravel (Kansan), the interglacial Gardiners clay (Yarmouth), the transitional Jacob Sand and the glacial Manhasset formation (both included in the Illinoian), the interglacial Vineyard formation (Sangamon ?, Iowan ?, and Peorian ?), the glacial Ronkonkoma and Harbor Hill moraines with associated till and outwash (all embraced in the early Wisconsin). Great periods of erosion occurred in post-Mannetto (Aftonian?) and Vineyard (Sangamon ?, Iowan ?, and Peorian ?) times. Two ice erosion unconformities are present in the Manhasset formation, which separate the Montauk till from the Herod gravel below and the Hempstead gravel above. The various Pleistocene deposits are discussed in detail.

Stream, marine, wind, and marsh deposits constitute the Recent series.

A summary, in tabular form, is given of the principal points of geologic interest on Long Island. The geologic history is fully sketched. The remainder of the report is concerned with an estimate of the relative lengths of the Pleistocene stages and substages on Long Island, the Pleistocene and Recent orogenic movements of Long Island, the probable extension of the Pleistocene deposits (here discussed) along the New England coast (including a correlation table), the correlation of the Long Island Pleistocene deposits with the New Jersey non-glacial formations.

V. O. T.